

## **VERSION WITH MARKINGS TO SHOW CHANGES**

### **TREE SHAKER PAD**

#### **FIELD OF THE INVENTION**

The present invention relates generally to an apparatus for  
5 harvesting fruit and/or nuts from the trees upon which they grow and deals  
more particularly with machinery for vibrating the trunks of these trees to  
dislodge the fruit or nuts therefrom for harvesting.

#### **BACKGROUND OF THE INVENTION**

10 Most nuts, olives, and some fruit are harvested using a tree  
shaker. These machines usually provide a mechanism for gripping a tree's  
trunk and shaking the tree thereby causing ripened nuts, olives, or fruit to fall  
to the ground or onto a collecting apron spread under the tree. Tree shaking  
devices typically include a pair of arms extending from a vehicle, which can be  
15 actuated to grip and vibrate the tree trunk. To protect the tree and to enhance  
the ability of the arms to grip the tree's trunk, a pad is positioned between each  
of the arms and the tree.

In general these pads are in the form of hollow natural rubber  
cylinders, one mounted on each of the arms between the arm and the tree. A  
20 difficulty associated with these known natural rubber pads is that during  
operation the vibratory forces generated by the tree shaker induce friction  
between the rubber pad and the tree. This friction causes the pads to overheat  
which in turn degrades the rubber resulting in decreased pad life. In addition,

the prior art pads tend to be somewhat hard and can themselves damage the tree. Pads of softer rubber better conform to the shape of the trunk and thus distribute forces more efficiently, but the pads wear out faster.

Based on the foregoing, it is the general object of the present invention to provide a pad for use with tree shaking equipment that overcomes the difficulties and drawbacks of prior art equipment.

It is a more specific object of the present invention to provide a pad for use between the trunk of a tree and the tree shaking equipment, that does not degrade as a result of frictional heat build up, as do known prior art pads.

### SUMMARY OF THE INVENTION

In accordance with the present invention, a pad for use with tree shaking equipment includes a pair of end sections each defining a bore extending therethrough. These bores are each adapted to receive a mounting member that forms part of a shaker head on a tree shaking device, thereby mounting the pads to the shaker head. A web of resilient polymeric material extends between the end sections and during operation, engages the trunk of the tree to be shaken. During operation, the tree is vibrated by the tree shaker causing the nuts or fruit to dislodge from the trees branches and fall to the ground.

To absorb the vibratory loads and any heat generated from friction during operation of the tree shaker, the web is made from a suitable material, such as polyurethane which is resistant to high temperature degradation, and has a higher modulus of elasticity than the rubbers currently used to make pads for tree shakers.

During operation of a tree shaker employing pads made in accordance with the present invention, it is possible that large strains and shear forces can be induced in the pad to the detriment of the pad's useful life. In order to alleviate these shear stresses and strains, the pads can incorporate apertures extending at least part way therethrough. Preferably, these apertures are positioned between the end sections of the pad adjacent to the above-described bores.

## BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the present invention and its attendant advantages will be readily understood by reference to the following  
5 detailed description considered in conjunction with the accompanying drawings. Corresponding reference characters indicate corresponding components of the several drawings, and:

FIG.1 is a partly in section perspective view of the tree shaker pad of the present invention.

10 FIG. 2 is a top view of the tree shaker pad as applied to a tree trunk.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, a tree shaker pad of the present invention for  
15 use with conventional tree shaking machines is generally designated by the reference number 20. The pad 20 includes a pair of generally cylindrical end sections 21, each defining a bore 22 extending axially therethrough. The bores 22 are approximately parallel to one another and are each adapted to releasably receive at least one mounting member that extends from a tree shaker head  
20 (not shown) extending from the tree shaking machine. A resilient web 24 extends between the end sections 21 and is made from a suitable material, such as, but not limited to polyurethane.

Still referring to FIG. 1, the web 24 is defined by an approximately planar first surface 26, that engages the trunk of a tree to be shaken, and a  
25 concave second surface 28 opposite the first surface. During operation, the concavity of the second surface 28, facilitates the engagement of the pad 20 with differently sized tree trunks by allowing the first surface 26 to readily wrap around, and conform to the shape and size of the different trunks. [If required during operation, planar surface 26 of resilient web 24 may also adopt  
30 a curvature.]

During operation of the tree shaker the pad 20 is subjected to shear forces and strains that have the potential to damage the pad. Accordingly, in the preferred embodiment of the present invention, a pair of

apertures 30 are defined by the pad 20, one positioned adjacent to each of the bores 22 and extending at least part way through the pad's width to relieve the strains induced in the pad during operation.

5 As shown in FIG. 2, a tree shaker employs a pair of pads 20 opposite one another, each engaging the trunk of the tree to be shaken. When positioned against a tree, the bores 22 are approximately parallel to the tree trunk 40, as well as to each other. During operation, vibratory forces are transmitted from the tree shaker, to the pads 20 and to the tree.

10 The above preferred and alternative embodiments are illustrative rather than exhaustive, and may be combined in whole or in part to attain a particular set of advantages. Such combinations, and modifications thereof, are within the scope of this disclosure and will be apparent to those skilled in the art consistent with the teachings herein. The scope of the following claims encompass such modifications and variations in accordance with the Doctrine  
15 of Equivalents.